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(71) Applicant (for all designated States except US): TRIO INDUSTRIER AS [NO/NO]; Postboks 38, N-4033 Forus (NO).

(72) Inventor; and

(75) Inventor/Applicant (for US only): EIDE, Ragnar [NO/NO]; Vølstadvien 6, N-4026 Stavanger (NO).

(74) Agents: HÅMSØ, Borge et al.; Håmsø Patentbyrå ANS, P.O. Box 171, N-4301 Sandnes (NO).

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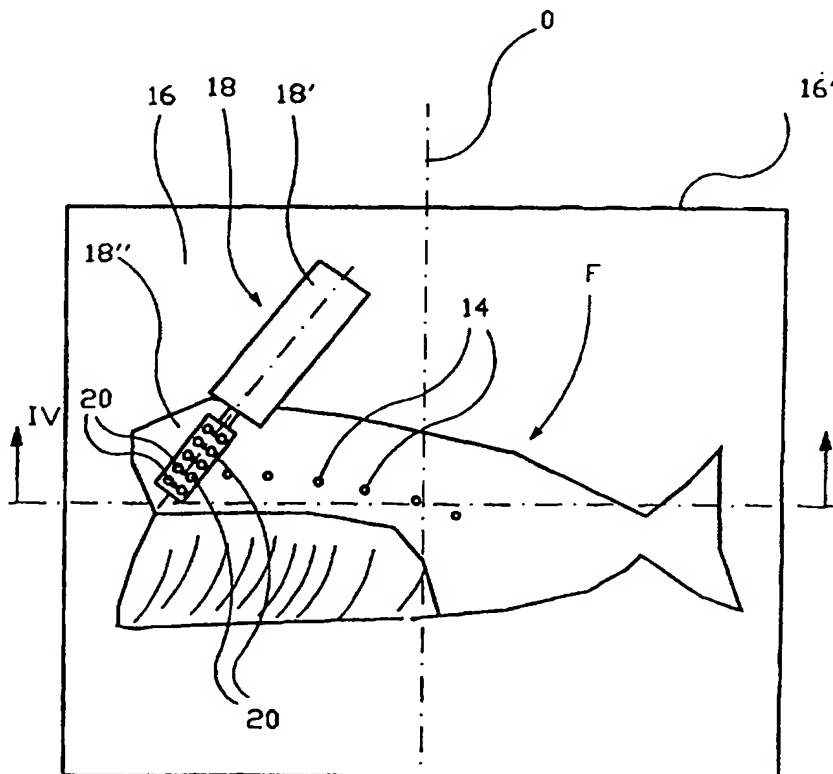
With international search report.

In English translation (filed in Norwegian).

(54) Title: METHOD AND MACHINE FOR REMOVING OF PIN BONES FROM FISH FILLET

(57) Abstract

A method and a machine for the removal of pin bones (14) from fish fillet (F), from which dorsal spine and preferably also ribs have already been removed. A pin bone-plucking device (18) with a rotatably driven, drum-shaped working head (18'') is used. In the circumferential surface of the latter plucking means (20) are formed. The fillet (F) is firmly fixed on a rotating freezing drum (16), and the plucking means (20) are placed at such a distance from the circumferential surface (16') of the freezing drum (16) that the plucking means (20) sweep the outwards facing side surface of the fillet (F) and grip and temporarily lock the pin bones (14) for subsequent plucking. If the processed fillets (F) have skin, they may be skinned by means of a skinning knife in a subsequent operation, while they maintain their initial position, frozen to the freezing drum (16), i.e. without any intermediate handling of the fillets (F).



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METHOD AND MACHINE FOR REMOVING OF PIN BONES FROM FISH FILLET

The present invention relates to a method and a machine for the removal of pin bones from fish fillet, in particular fillet of salmon. The removal of pin bones may be carried out as an independent operation in a separate machine, but is preferably implemented in a machine arranged to carry out a subsequent skinning of the fillet. A known skinning machine may then be modified by the provision of a tool, arranged to remove said pin bones after the removal of dorsal spine and ribs in preceding operations. However, there is in principle nothing preventing removal of the pin bones independently of a subsequent skinning, i.e. from fillets which have already been skinned prior to the removal of pin bones. However, removal of pin bones followed by skinning in one and same machine is the preferred but non-limiting embodiment of the invention, in which the two fish processing operations take place without any intermediate reorientation or other handling of the fillet, which is thus positioned in an initial loading operation for the safe fixation during the following operation of removing pin bones. This posi-

tional fixation is then utilized without changes for the skinning operation.

When, during the filleting of fish, cuts are made along the dorsal spine and ribs as these bones are cut away, the so-called pin bones, which, in a cross-section through a fish, extend essentially perpendicularly from the dorsal spine and otherwise point backwards towards the tail, are not removed along with the former bones. After the dorsal spine and the ribs have been cut away in the filleting, the pin bones are no longer really anchored to the fillet, except through adhesion to the surrounding flesh of the fish. Pin bones may thus be pulled out/plucked from the fish flesh, for example by means of manually operated tweezer-like tongs. A plate element with slot-like holes tapering towards one end, might in principle also be used, the plate element being passed across the fillet, with the slots in the direction in which the pin bones follow one behind the other in the longitudinal direction of the fillet, with the tapering end portion of the slots, so as to bring the projecting end portion of the pin bones into the slots, and lock them at the tapered ends of the slots for subsequent jerking out of the fillet. After being plucked, the pin bones must be removed from the tool, which may possibly have been used for their removal.

The majority of the species of fish being caught and used in Norway, contain pin bones. Herring has several pin bones, so thin that they are mostly ignored. The pin bones of cod are cut away in special cod filleting machines. In the machine a V-shaped cut is made from the neck area to about half-way along the fillet, which is divided thereby, which is not desirable for other species of fish.

Thus, for salmon, trout and char whole fillet is desirable, and conventional pin bone removal has mainly consisted in plucking by means of tongs. This is relatively time-consuming work, and experience shows that it tends to result in wrist injuries because of the strain.

Attempts have been made to develop machines and/or tools which might facilitate the work of removing pin bones. Only tools which themselves are rotationally driven, but are otherwise manual, have been provided, which tools are passed by hand with their rotational fishbone-jerking tool across the fillet. Known tools of this kind comprise a rotating drum whose circumferential surface is formed with notches whose edges form "hangers" for the fixed hitching of projecting end portions of the pin bones and the plucking of these in the continued rotation of the tool.

A known tool of this kind is disclosed in Swedish patent publication No. 500 531. The tool is constructed on a rotationally driven drum, whose circumferential surface is configured with a number of elongated notches oriented with their longitudinal direction in the circumferential direction of the drum, and having a wide leading end leading in the rotational direction of the drum, and a tapering trailing end. These notches form grippers for the projecting ends of ribs while the tool is passed across a supported, but not intentionally fixed fish fillet. The axis of the handle is coincident with the axis of rotation the drum.

This known tool is heavy in handling, and the result of the plucking is usually somewhat poorer in terms of

both quality and quantity than manual pinbone-yanking by means of tongs.

- These unsatisfactory results of fishbone removal with this known tool according to SE 500 531 may be connected to the following conditions: (i) The manual operation, which involves uneven passing of the tool when applied; (ii) the poorly protruding positions of the projecting end portions of the fishbones; and (iii) the fish fillet not being completely fixed during the plucking of the bones. It should therefore, at least in principle, be possible for the rotatably driven drum with the notches formed in the circumferential surface and having the above mentioned elongated, tapering form and orientation in relation to the direction of rotation of the drum, to be used with a more favourable function in terms of quality and quantity, if used in a machine, in which said unfavourable conditions (i) - (iii) had been eliminated or improved to a considerable extent.
- 20 The general purpose of the invention was to provide a rational method and an efficient machine for removing pin bones by means of for example a modified fishbone-plucking tool known in itself (cfr. SE 500 531), by which the fish fillet is not of poorer quality after
- 25 the treatment, and in which the processing of the fillets takes place while they are firmly fixed; and in which the removal of the pin bones is preferably followed by a skinning operation, in which the orientation of the initial position and the firm fixation of the
- 30 fillet is utilized once again.

The purpose is realized according to the present invention respectively by a method in accordance with the

characterizing part of claim 1 and by means of a machine for removing pin bones from fish fillet, having the characteristics that appear from the characterizing part of the following claims.

- 5 For several years it has been known for skinning machines for fish fillets to use a cooled, rotating drum - a so-called freezing drum - for the fixation of the fillet during the skinning operation which has usually been implemented by means of a band cutter, whose cutting edge may be adjustable in relation to adjacent portions of the circumferential surface of the drum passing in rotation. Fillet is fed into the skinning machine in such a way that the skin side of the fillet freezes to the circumferential surface of the rotating cold drum. The fillet is then fixedly held in position on the cold drum, by the water on the surface chrysalizing, thus freezing the fillet thereto. The freezing is concentrated to the surface of the skin. The skinning itself is done by a rotating band cutter separating the fillet from the skin, whereafter the skin remains stuck to the surface of the drum until one or more scraping means, which are movable towards the circumferential surface of the drum and away from it, are brought into working position and thus scrape skin and any frozen up pieces of fish flesh off the drum during the continued rotation of the latter.

- The present invention is based on the idea of detecting and removing pin bones from fillet, which is fixedly frozen to and positioned on a rotatable freezing drum.
- 30 In far most cases the fillets are to be skinned after the removal of the pin bones. Thereby different operations are combined and the handling of the fish fillets is reduced.

The fillets being fixedly frozen to a rotating drum meets one of the requirements for making use of a pin bone plucking tool of the principal type disclosed in SE 500 531. The fish fillets bearing on the arcuate
5 circumferential surface of the rotating freezing drum, causes the free side of fish flesh with the hardly projecting end portion of the pin bones to bend, and the bones stand out stiffly, so that they are more easily brought into a fixing engagement with, for example,
10 tapering hole circumferences defining notches/recesses in the circumferential drum portion of the fishbone-jerking tool. The not manually supported, accurately positioning of such a tool or a similar tool in relation to the fixed fillet, which is lead past the tool
15 along an unchangeable circular arc, will provide a more successful plucking, in terms of both quantity and quality. As concerns the factors (i) - (iii), there has, according to the invention, been made an improvement to all of them.

20 By the tool according to the above SE 500 531 the notches in the circumferential surface portion of the driven, rotatable drum have the form of an elongated narrow groove provided by milling, and in the one end of which a recess has been milled, so as to form a funnel
25 which is of importance to the ability of the tool to catch fish bones projecting from the fish flesh. Since the pin bone end portions projecting from the fillet side, do not all point in the same direction, the driven, rotatable drum of the tool should have a
30 catching or guiding means guiding the pin bones into said holes/notches. By the tool according to SE 500 531 said funnel-shaped recess constitutes exactly such a catching or guiding means when the tool is passed across a supported, not fixed fillet. These notches,
35 formed in the circumferential surface portion of the

drum, may with advantage be located flush with each other, both in the circumferential direction of the driven, rotatable tool drum and transversely to the circumferential surface. The funnel-shaped guiding means should according to said SE patent document have such form that their edge lines are mainly tangent to each other.

Respectively by a method and in a machine according to the invention, any pin-bone-plucking tool may in principle be used in combination with a freezing drum, provided that it is suitable for processing a fillet, which bears, through freezing, against a curved circumferential surface of a rotating drum.

In a machine according to the invention it is an obvious advantage if it is equipped with a detector arranged to detect whether all pin bones have been pulled out or not, before the treated fish fillet has left the machine. Fillet, which after treatment still contains stuck pin bones, shall be separated from the pinboneless fillets and perhaps be subjected to a manual pinbone-plucking operation.

The method and machine for the removal of pin bones in accordance with the present invention will be explained in detail in the following in connection with a non-limiting example of a possible embodiment, which is illustrated in the accompanying drawings, in which

Fig. 1 shows a cross-section through an eviscerated salmon;

Fig. 2 shows a fillet after the dorsal spine and the ribs have been cut away, but with remaining pin bones which are now anchored to the fillet only through the mutual adhesion of bones and tissue;

- 5 Fig. 3 shows a fillet frozen to a freezing drum and under the influence of a plucking tool for the pin bones, seen from above;

Fig. 4 shows, on a larger scale, a cross-section along the line IV-IV in Fig. 3;

- 10 Fig. 5 shows a schematic side view of a machine configured according to the invention.

Reference is first made to Figs. 1 and 2 which respectively show cross-sections through an eviscerated fish 2F and a fillet F originating from the former and from which dorsal spine 10 and ribs 12 have been cut away, while pin bones 14 are still left.

The fish skin is designated S.

The essence of the invention is illustrated in Figs. 3 and 4 in which the reference numeral 16 indicates a freezing drum known in itself, whose circumferential surface the wet skin S of a fish fillet F is brought into contact with for the freezing and fixation thereto, as appears from Figs. 3 and 4, from which the orientation of the fillet F clearly appears. In Fig. 2 is indicated in dotted line approximately what the cross-section of the fillet F will look like, when the skin has frozen to a circumferential surface 16' of the

freezing drum 16. The axis of rotation of the freezing drum 16 is designated 0.

A driven rotatable pin-bone-plucking tool 18, for example of the kind disclosed in SE patent No. 500 531, or
5 of a similar kind, whose mounting part 18' is mounted on a skinning machine, Fig. 5, preferably with adjustment possibilities for its active pin bone-plucking part in the form of a small, driven, rotatable cylindrical drum 18" which along its circumferential surface
10 has holes, notches or recesses 20 formed therein and with delimiting edges, holes and edges of holes forming plucking means for end portions 14' of projecting pin bones 14. Such a pin bone-plucking means must have two opposite hole/notch/recess-defining, converging material edges, which between themselves catch the projecting end portion 14' of a pin bone during the rotation
15 of the plucking drum 18". Fig. 5 shows, in a greatly simplified side view, the main components comprised by a machine for plucking pin bones, preferably with subsequent skinning, from which, among other things, the machine frame has been left out and is represented only
20 by a line R.

Apart from the arrangement of the pin bone-plucking device 18 near the freezing drum 16, for plucking pin
25 bones 14 from a fillet F while the latter is frozen to the circumferential surface 16' of the freezing drum 16, the longitudinal direction of the fillet F being preferably parallel to the axis of rotation 0 of the freezing drum 16, the shown fish processing machine is
30 essentially configured as a skinning machine, and in the preferred embodiment of the present invention the machine will comprise a skinning knife well known in itself, preferably in the form of a rotating band cut-

ter 22, which may be placed somewhat above the pin bone-plucking device 18 according to the invention. The band cutter 22 is mounted on a pivotal arm 24 having a pivot point 26 formed by a pivot between a pair of lugs 28 on the machine frame R.

On an outgoing axle and concentric therewith, a driving motor 30 mounted on a bracket 32 on the machine frame R, is provided with a first chain wheel 34, which by way of a chain 36 drives the freezing drum 16. The chain 36 is placed over a guiding, second chain wheel 38, and from there along a circular arc portion of the circumference of a third chain wheel 40, having a coaxial, fourth chain wheel 42. The driven fourth chain wheel 42 again drives a fifth chain wheel 44 driving one, driven guide roller or similar 46 for an endless fillet conveyor 48 of well known type, and whose second guide roller is designated 46'.

In the area of the at any time lower portion of the freezing drum 16 immediately above an upper portion 48' of the conveyor 48 passing there below, the upper portion 48' of the conveyor 48 may have a deflected portion (indicated in Fig. 1), well known in itself, to ensure that the skin side S of the fillet is subjected to a resilient pressing against the circumferential surface 16' of the drum 16 as the fillet skin is brought to bear against and freeze to said circumferential surface. This represents a technology well known in itself.

The reference numeral 50 indicates a skin scraper known in itself, and arranged to be displaceable between an active scraping position with its scraping edge almost bearing against the circumferential surface of the drum

16, and an idle and stand-by position in which the scraper 50 is withdrawn and out of the way during the passing of the freezing drum 16 with the fillet F.

5 The reference numeral 52 designates a supply chute for fillets F.

The fillet F is fed into the machine, so that the pin bones 14 come to lie on a defined line on the feeding conveyor 48, see Fig. 3.

10 The actual plucking means 20 of the pin bone-plucking device 18, having the form of notches or similar, are positioned in such a manner that they are on said defined line.

15 Apart from the rotational natural movement of the plucking drum 18", the pin bone-plucking device is mounted stationary to the machine frame R, preferably adjustable, for example pivotally/displaceably. Adjustment devices for this purpose, either gradual or indefinitely variable, are known in a wide variety of embodiments and are in themselves not part of the present invention.

25 The main principle for plucking the pin bones 14 consist in the plucking device 18 sweeping the fillet F as it passes in rotation, whereby the actual plucking means grip and pull the pin bones 14 out in approximately the same direction as the one adopted by the bones 14 in the fillet F.

The plucking device may have a completely different constructional configuration than the mainly described

form. It is thus conceivable that the shown plucking device is replaced by a similar device which is based on the use of tweezer-like, movable tongs (not shown), located on the same place as the plucking means 20 of the plucking device 18, Fig. 3.

A not shown detector, sensor, etc. is provided, which monitors and detects if there are still bones in the fillet F. If the detector/sensor detects remaining pin bones, the bone-containing fillet is brought out on a separate conveyor (not shown) for subsequent manual checking and removal of pin bones.

The fillet F from which pin bones have been removed, is then usually subjected to skinning in a manner known in itself, by the frozen up fillet, free of pin bones, passing through the working/cutting area of said band cutter 22 or other skinning knife.

C l a i m s

1. Method for the removal of pin bones (14) from fish fillet (F), from which dorsal spine and preferably also ribs (10, 12) have already been removed in a preceding fish processing operation, characterized in that the fillets (F) are frozen by their skin side, or by a skinned fish flesh side, to and bearing against a circumferential surface (16') of a rotatable freezing drum (16) known in itself, and that the pin bones (14) are plucked out of the fillet, the latter being fixedly supported by the rotating freezing drum (16), by means of a pin bone-plucking device (18) which is brought into a natural movement, for example rotation, but which is stationarily positioned near the axis of rotation (0) of the rotating freezing drum (16), and whose plucking means, for example in the form of notches (20) etc. causing said natural movement, for example rotation, works in contact with - or in the immediate vicinity of - the outwards facing side surface of the rotating fillet (F).

2. Method according to claim 1, characterized in that the plucking device (18) which is provided with a cylindrical, rotatably operated drum (18") in the circumferential layer of which said plucking means (20) are formed, is forcedly rotated in the same direction as the freezing drum (16), during which its circumferential surface with the plucking holes/notches (20) formed therein, are brought to sweep said outwards facing side surface of the fillets (F) during the plucking of pin bones.

3. Method according to claim 1 or 2, c h a r a c -
t e r i z e d i n that, after the removal of the pin
bones, the fillets (F) are subjected to skinning by
means of a skinning knife (22) known in itself, while
5 they are held in their initial position, frozen to the
circumferential surface (16') of the freezing drum
(16).
4. Method according to one or more of the preceding
claims, c h a r a c t e r i z e d i n that the fil-
10 lets (F) on being fed into a machine provided with a
rotatably driven freezing drum (16) and a pin bone-
plucking device (18), are oriented in such a manner in
relation to the axis of rotation (0) of the freezing
drum (16), that the longitudinal direction of the fil-
15 lets (F) will extend substantially in the circumferen-
tial direction/direction of rotation of the freezing
drum (16).
5. Machine for the removal of pin bones from fish fil-
let (F), from which dorsal spine and preferably also
20 ribs have been removed in a preceding fish processing
operation, comprising a rotatably driven freezing drum
(16), to the circumferential surface (16') of which the
skin side (S) or the skinned side of the fillets (F) is
to be frozen, and in which the fillet (F) is thus fix-
25 edly held and thus joins in the rotation of the freez-
ing drum (16) in subsequent processing operation(s),
c h a r a c t e r i z e d i n that the machine com-
prises a pin bone-plucking device (18), mounted in the
vicinity of the circumference (16') of the freezing
30 drum and preferably on the machine frame (R).
6. Machine according to claim 5, c h a r a c t e r i -
z e d i n that the pin bone-plucking device (18)

comprises a mounting part (18') which is stationary, but possibly adjustably mounted on the machine frame (R), and which forms a rotatable support for a drum-shaped working head (18") in the circumferential surface layer of which are formed notch-like or recess-like pin bone-plucking means (20), which are elongated in the direction of rotation of the working head (18") and preferably are formed with a relatively wide leading end for the reception of the end portion of a pin bone, the wide leading end tapering towards the trailing end, in which the pin bone will be stuck and subsequently yanked out in the joint rotation of the drum-shaped working head (18") and the freezing drum (16).

7. Machine according to claim 5 or 6, characterized in that a vertical plane through the axis of rotation of the rotatably driven drum-shaped working head (18") of the pin bone-plucking device (18) forms an acute angle to a vertical plan through the axis of rotation (0) of the freezing drum (16).

8. Machine according to one or more of the claims 5 to 7, characterized in that the rotatably driven, drum-like working head (18") of the pin bone-plucking device (18) is arranged to be driven in the same direction of rotation (0) as the freezing drum (16).

9. Machine according to any of the claims 5 to 8, characterized by an inlet chute (52) above the upper, essentially horizontal part (48') of a driven, endless conveyor (48) extending immediately below the at any time during the rotation lower portion of the freezing drum (16), which feeding assembly (52, 48) for fillet (F) is arranged to feed fillets (F) with

their longitudinal direction essentially coincident with the circumferential direction of the freezing drum (16).

10. Machine according to any of the claims 5 to 9,
5 characterized in that the machine is equipped with at least one sensor arranged to detect whether there are still bones in the fillet (F) after the pin bone-plucking.

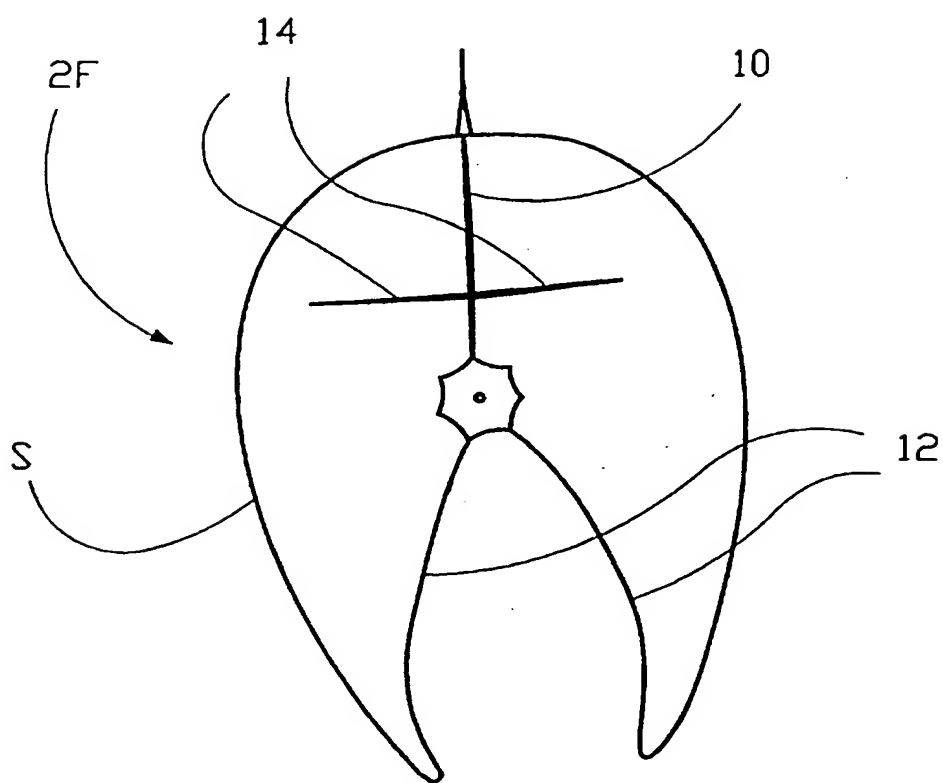


Fig. 1

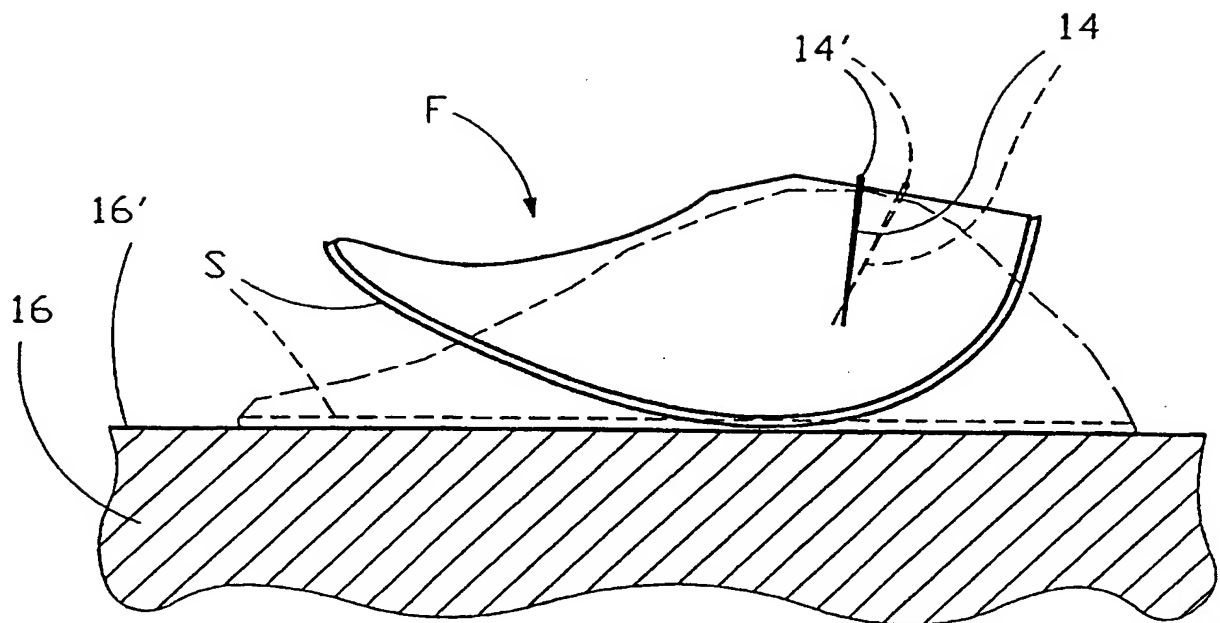


Fig. 2

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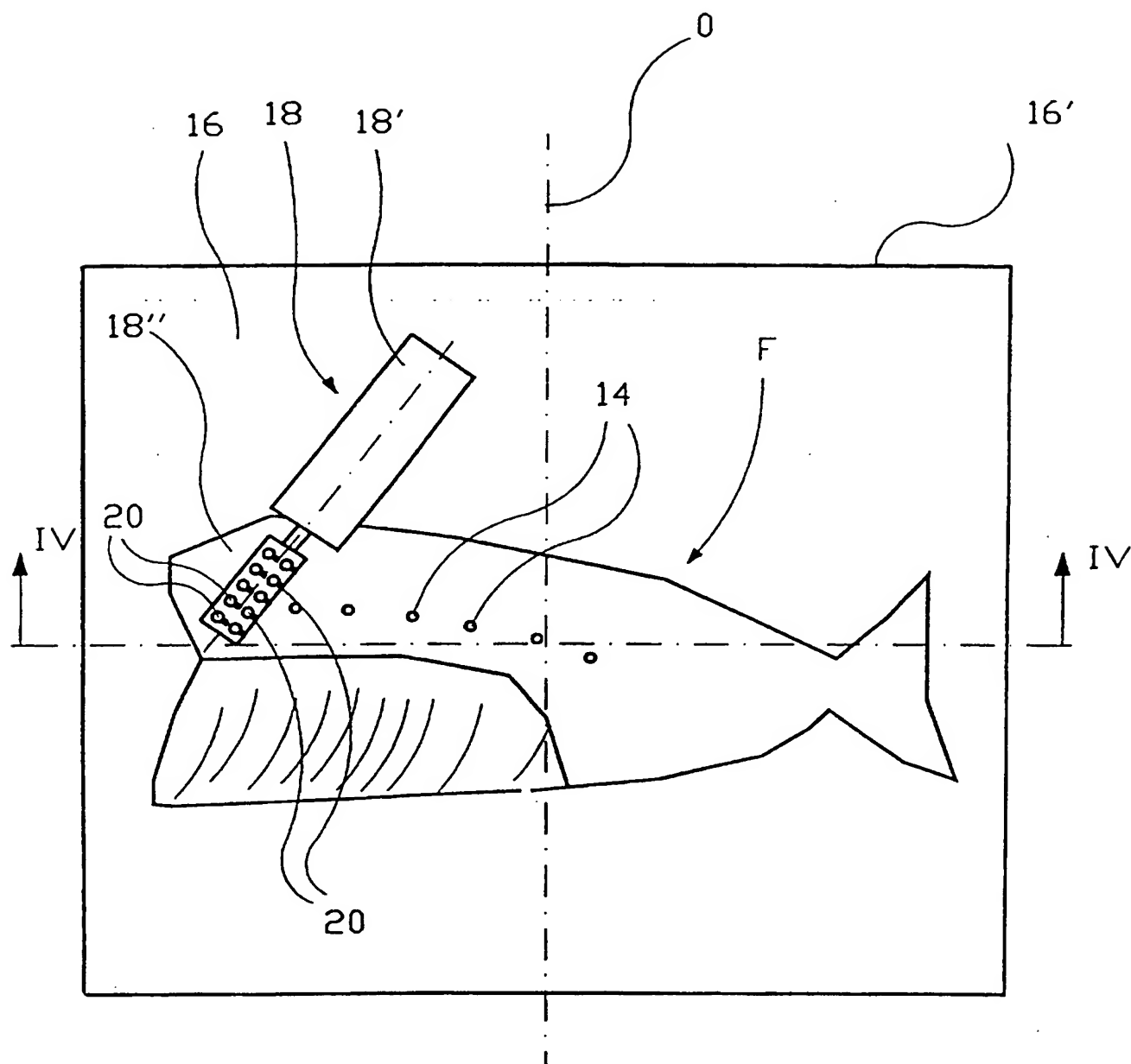


Fig. 3

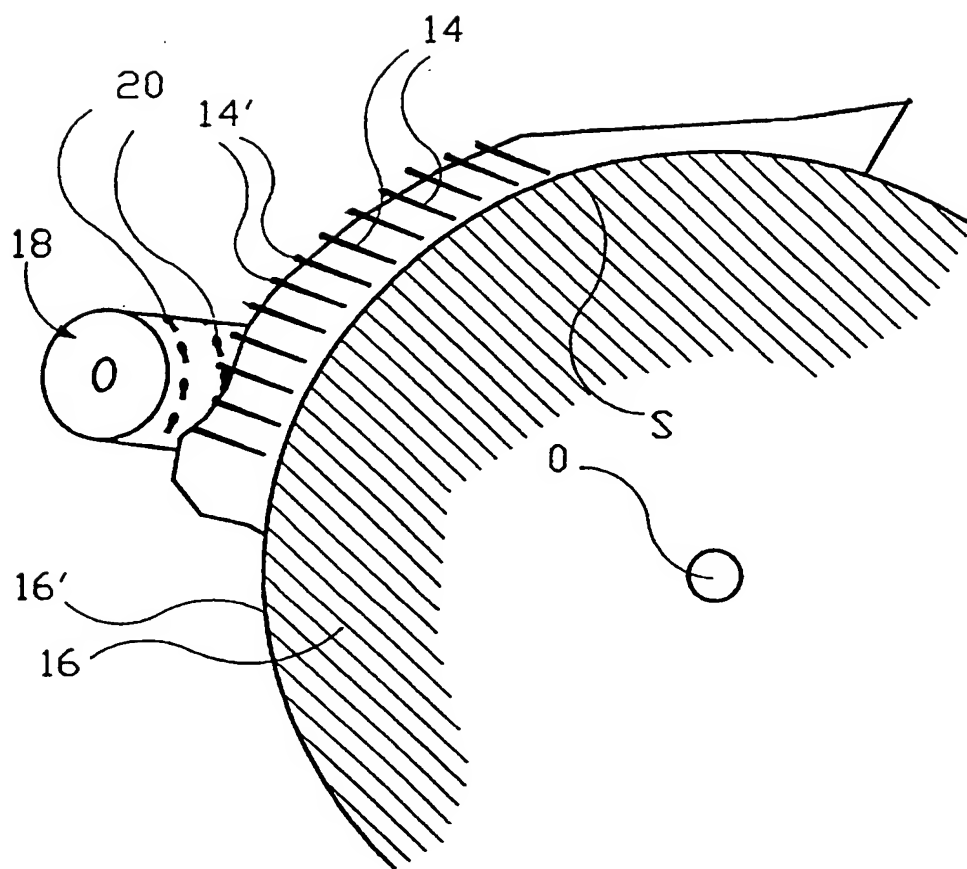


Fig. 4

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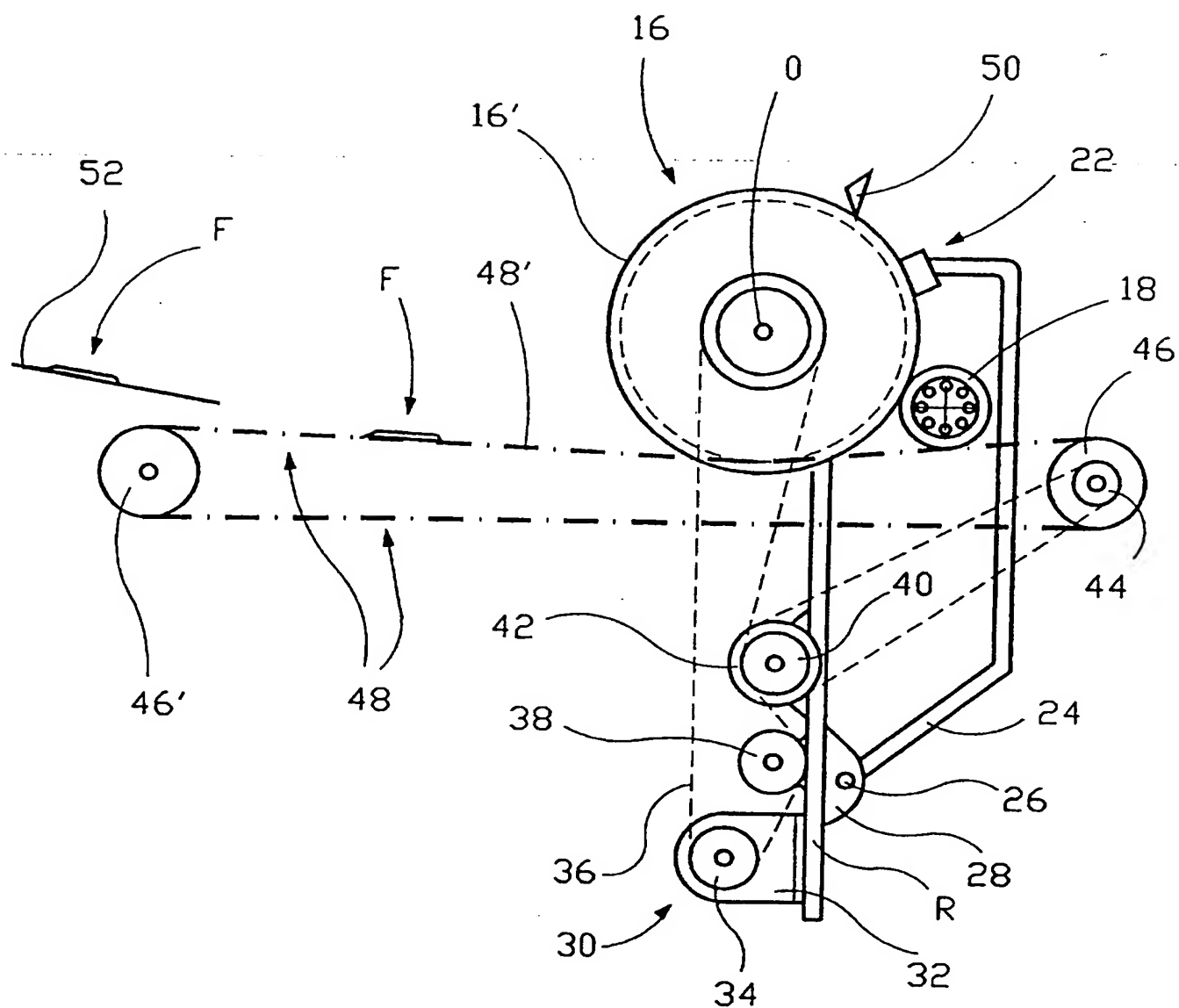


Fig. 5

1
INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 97/00196

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A22C 25/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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IPC6: A22C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 2641427 A1 (VEB VOLKSWERFT STRALSUND), 12 May 1977 (12.05.77) --	
A	SE 500531 C2 (JAN SÖDERLIND), 11 July 1994 (11.07.94) --	
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A	WO 9616554 A1 (TRIO INDUSTRIER A/S), 6 June 1996 (06.06.96) --	

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 97/00196

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT
Information on patent family members

01/10/97

International application No.

PCT/NO 97/00196

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NO	163351	B	05/02/90	NONE	
WO	9616554	A1	06/06/96	AU 4124896 A NO 180702 B,C NO 944563 A	19/06/96 24/02/97 16/07/96
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